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10/673,514	09/30/2003	Hideaki Miyoshi	243294US6YA	1592

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EXAMINER	
ARANCIBIA, MAUREEN GRAMAGLIA	
ART UNIT	**PAPER NUMBER**
1792	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/673,514	MIYOSHI ET AL.	
	Examiner	Art Unit	
	Maureen G. Arancibia	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _13 November 2007_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-8 and 11-49_ is/are pending in the application.

4a) Of the above claim(s) _20-49_ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-8 and 11-19_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _25 April 2006_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-3, 5-7, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,882,424 to Taylor et al. in view of Japanese Kokai 06-243992 to Deguchi et al. The following rejection refers to the Figures and English Machine Translation of Deguchi et al.

In regards to Claim 1, Taylor et al. teaches a method of operating a plasma processing system (Figure 1, for example), comprising: positioning a substrate on a substrate holder 14 in a processing chamber 12 (*Taylor et al. teaches that the substrate is typically not held in the chamber during chamber cleaning operations, which teaching therefore includes the atypical case wherein the substrate is held in the chamber during chamber cleaning operations*); initializing the plasma processing system; igniting a plasma by applying to a first electrode 18 or 20 in the processing chamber a first RF signal at a first RF frequency from a first RF source 24 to ignite the plasma, and thereafter providing to the same electrode (*one or both of the electrodes 18, 20*) a second RF signal at a second RF frequency from a second RF source 26 so as to maintain the plasma while the first RF frequency is being changed to the second RF frequency, wherein the first RF frequency is higher in frequency than the second RF

frequency; and sustaining the plasma using the second signal applied to the same electrode at the second RF frequency. (Column 7, Lines 1-13)

Taylor et al. expressly teaches that the first RF source 24 and the second RF source 26 can be replaced by a single power source which is capable of generating multiple RF signals of differing frequency. (Column 7, Lines 46-48)

This express teaching of Taylor et al. is believed to anticipate the recitation in Claim 1 that the first RF signal and the second RF signal are both provided by a first (i.e. single) RF source.

However, in the event that it is considered that the teaching of Taylor et al. of a single power source is taught only in relation to a different embodiment of Taylor et al., Claim 1 is alternatively rejected under 35 U.S.C. 103(a). It would have been obvious to modify the method of Taylor et al. discussed above, if not expressly taught by Taylor et al., to supply the first and second RF signals from a single power source capable of generating multiple RF signals of differing frequency, as an art-recognized equivalent means, as taught by Taylor et al., of supplying RF signals having different frequencies to an electrode. It has been held that an express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982).

Taylor et al. does not expressly teach that the matching circuit comprises only one variable impedance element.

Deguchi et al. teaches that a matching circuit 14 for a variable frequency RF source 12 should comprise a fixed set of series components and a variable shunt capacitor 22 connected to ground. (Figure 1 ; EMT, Paragraphs 13-16)

It would have been obvious to one of ordinary skill in the art to modify the matching cirucit taught by Taylor et al. to comprise only one variable impedance element, as taught by Deguchi et al. The motivation for making such a modification to the matching circuit, as taught by Deguchi et al. (English Machine Translation, Paragraphs 11, 19, 20, 30, and 31), would have been that the combination of such a matching sub-circuit with a variable frequency RF source (as taught by Taylor et al.) allows the impedance of the RF signal to be matched to the impedance of the plasma quickly with fewer variable capacitors and overall smaller equipment size by varying the frequency of the RF signal generated by the RF source and by varying the shunt capacitance.

In regards to Claims 2 and 3, Taylor et al. teaches an example wherein a first power level of the first RF signal is set to about 110-500 Watts (the total excitation power remains between about 200-1000 Watts with the power of the second RF signal being set between about 90-500 Watts), which meets the recitation of being at least 50 Watts. (Column 8, Lines 15-44)

In regards to Claim 5, Taylor et al. teaches providing and tuning a matching network 28. (Column 7, Lines 51-63)

In regards to Claims 6 and 7, Taylor et al. teaches an example wherein a first RF frequency is 13.56 MHz and a second RF frequency is about 200-600 kHz, thus

meeting the recitation that the first RF frequency is at least two percent, and specifically at least ten percent higher in frequency than the second RF frequency. (Column 8, Lines 15-44)

In regards to Claim 11, Taylor et al. teaches that the first signal is provided for a first time period (*until the plasma has been generated*) and the second signal is provided for a second time period (*thereafter…to sustain the plasma during the cleaning operation*). (Column 7, Lines 1-13)

3. **Claims 4, 8, and 13-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taylor et al. in view of Deguchi et al. as applied to Claims 1 and 5 above, and further in view of U.S. Patent Application Publication 2003/0151372 to Tsuchiya et al.**

The teachings of Taylor et al. and Deguchi et al. were discussed above.

In regards to Claim 4, Taylor et al. further teaches introducing a process gas into the processing chamber, such as a carbon-containing gas or a fluorine-containing gas. (for example C_2F_6, NF_3, or SF_6) (Column 5, Lines 28, 37, and 44)

The combination of Taylor et al. and Deguchi et al. does not expressly teach that the chamber pressure is established below approximately 0.5 Torr.

Tsuchiya et al. teaches, in a method of operating a plasma processing system, that chamber pressure can be established below approximately 0.023 Torr (3 Pa). (Paragraph 105)

It would have been obvious to one of ordinary skill in the art to modify the method taught by Taylor et al. and Deguchi et al. to establish the chamber pressure to be a

lower pressure, specifically below approximately 0.023 Torr as taught by Tsuchiya et al. The motivation for doing so, as taught by Tsuchiya et al. (Paragraph 5), would have been that lowering process pressures prevents inclusion of foreign particles and allows for the advancement of fineness of circuits.

In regards to Claim 8, the combination of Taylor et al. and Deguchi et al. does not expressly teach that the first RF frequency is greater than approximately 40 MHz.

Tsuchiya et al. teaches that a first RF frequency used to ignite the plasma can be 60 MHz, which is greater than 40 MHz and more than 10% higher in frequency than a second RF frequency of 13.56 MHz used to sustain the plasma. (Paragraph 51)

It would have been obvious to one of ordinary skill in the art to modify the method taught by Taylor et al. and Deguchi et al. to have the first RF frequency used to ignite the plasma be greater than 40 MHz, as taught by Tsuchiya et al. The motivation for making such a modification, as taught by Tsuchiya et al. (Paragraphs 9-15), would have been to increase plasma generation efficiency by igniting the plasma with a frequency in the VHF band.

In regards to Claims 13 and 14, the combination of Taylor et al. and Deguchi et al. does not expressly teach the recited steps.

Tsuchiya et al. teaches that a plasma processing method can comprise: determining a forward power for a first RF signal used to ignite the plasma and being provided by the first frequency source; determining a reflected power for the first signal being returned to the first frequency source; and determining when the plasma has

been ignited using the forward power and the reflected power. (Paragraphs 59-65 and 108)

It would have been obvious to one of ordinary skill in the art to include the steps taught by Tsuchiya et al. of determining ignition using forward and reflected power in the method taught by Taylor et al. and Deguchi et al. The motivation for making such a modification, as taught by Tsuchiya et al. (Paragraph 60), would have been to allow the impedance of the matching unit to be optimized at the moment of plasma generation.

In regards to Claims 15 and 16, the combination of Taylor et al. and Deguchi et al. does not expressly teach the claimed steps.

Tsuchiya et al. teaches that the ignition and maintenance of the plasma are determined using at least one optical frequency obtained by an optical frequency monitoring system coupled to the processing chamber. (Paragraphs 73, 78, 79, 82)

It would have been obvious to one of ordinary skill in the art to modify the method taught by Taylor et al. and Deguchi et al. to include the detection steps taught by Tsuchiya et al. The motivation for making such a modification, as taught by Tsuchiya et al. (Paragraphs 79-82), would have been to use an alternate means of detecting plasma generation, both to ensure plasma generation and to allow for the timed optimization of the process settings.

In regards to Claims 17 and 18, the combination of Taylor et al. and Deguchi et al. does not expressly teach the claimed steps.

Tsuchiya et al. teaches tuning the first matching network form the initial condition to an operating condition, and verifying that the plasma has not extinguished.

(Paragraphs 90-97) Tsuchiya et al. also teaches that the first matching network is tuned from the initial condition to the operating condition in less than 4 seconds (about 1 second). (Paragraphs 117 and 121)

It would have been obvious to one of ordinary skill in the art to modify the method taught by the combination of Taylor et al. and Deguchi et al. to include the tuning and verification steps as taught by Tsuchiya et al. The motivation for making such a modification, as taught by Tsuchiya et al. (Paragraph 90), would have been to optimize the impedance of the matching network at the moment of ignition to maximize the proportion of RF power coupled with the plasma and retain the plasma efficiently.

In regards to Claim 19, the combination of Taylor et al. and Deguchi et al. does not expressly teach coupling a second RF source to the second electrode and providing additional power to the plasma.

Tsuchiya et al. teaches that a plasma processing method further comprises coupling an RF source 50 to second electrode (and substrate support) 5, and providing additional power to the plasma. (Paragraphs 56 and 57)

It would have been obvious to one of ordinary skill in the art to couple a second RF source to a second (substrate-supporting) electrode 20 taught by the combination of Taylor et al. and Deguchi et al. and to supply additional power to the plasma, as taught by Tsuchiya et al. The motivation for making such a modification, as taught by Tsuchiya et al. (Paragraph 56), would have been to generate a self-biasing voltage at the substrate to be processed to control the ion incidence on the substrate.

4. **Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Taylor et al. in view of Deguchi et al. as applied to Claim 11 above, and further in view of U.S. Patent 5,441,596 to Nulty.**

The teachings of the combination of Taylor et al. and Deguchi et al. were discussed above.

In regards to Claim 12, the combination of Taylor et al. and Deguchi et al. does not expressly teach that the first time period has a duration that ranged from about 10 ms to about 1 s.

Nulty teaches that a first RF signal can be applied for a time period of 1 s. (Column 4, Lines 1-16)

It would have been obvious to one of ordinary skill in the art to modify the method taught by the combination of Taylor et al. and Deguchi et al. to have the first time period be only 1 s long. The motivation for making such a modification, as taught by Nulty (Column 2, Lines 37-45, Column 4, Lines 1-16, Column 6, Lines 47-56), would have been to consistently, repeatably ignite the plasma while still expanding the operating range of the plasma process to higher powers and lower pressures.

5. **Claims 1-8, 11, and 13-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent Application Publication 08-031753 to Tashiro et al. in view of U.S. Patent Application Publication 2003/0151372 to Tsuchiya et al. and Deguchi et al. The following rejection refers to the Official English Translation of Tashiro et al. and to the Figures and English Machine Translation of Deguchi et al.**

Tashiro et al. teaches a method of operating a plasma processing system (Figure 4), comprising: positioning a substrate 407 on a substrate holder (second electrode) 409 in a processing chamber 404; initializing the plasma processing system (Paragraph 44); igniting a plasma by applying to a first electrode 410 a first RF signal at a first RF frequency from a first RF source 413 (*frequency adjustable RF and the VHF common power source 413*; Paragraph 45) to ignite the plasma (*RF was first impressed…this…starts discharge*; Paragraph 45) and thereafter providing to the first electrode from the first RF source 413 a second RF signal at a second RF frequency (*When discharge began, the RF of a power source was changed to the VHF field*; Paragraph 45); and sustaining the plasma using the second signal applied to the first electrode at the second RF frequency (*the stable VHF plasma was acquired*; Paragraph 45).

In regards to Claims 1 and 6-8, Tashiro et al. does not expressly teach that the first RF frequency is greater than the second RF frequency, greater than 40 MHz, and at least 10% higher in frequency than the second RF frequency.

Tsuchiya et al. teaches that a first RF frequency used to ignite the plasma can be 60 MHz, which is more than 10% higher in frequency than a second RF frequency of 13.56 MHz used to sustain the plasma. (Paragraph 51)

It would have been obvious to one of ordinary skill in the art to modify the method taught by Tashiro et al. to have the first RF frequency used to ignite the plasma be greater than 40 MHz and more than 10% higher in frequency than a second RF frequency used to sustain the plasma, as taught by Tsuchiya et al. The motivation for

making such a modification, as taught by Tsuchiya et al. (Paragraphs 9-15), would have been to increase plasma generation efficiency by igniting the plasma with a frequency in the VHF band, but to avoid weakening the sheath electric field by having the frequency be too high during processing.

Further in regards to Claim 1, Examiner asserts that it is inherent in the method taught by the combination of Tashiro et al. and Tsuchiya et al. that the plasma is maintained while the first RF frequency of the RF source is changed to the second RF frequency. Tashiro et al. expressly teaches that plasma is maintained as the frequency supplied by an RF source is changed. (*the…plasma was transited*; Paragraph 45) Tsuchiya et al. also teaches that plasma is maintained while a first, higher RF frequency is changed to a second, lower RF frequency (*the ion-incidence [lower] RF voltage can be applied…after the plasma settles to be in a stable state*). Examiner asserts that there is nothing in the method taught by the combination of Tashiro et al. and Tsuchiya et al. that would cause the plasma to become extinguished as the frequency of the RF source is changed. When a rejection is based on inherency, a rejection under 35 U.S.C. 102 or U.S.C. 103 is appropriate. (See *In re Fitzgerald* 205 USPQ 594 or MPEP 2112).

The combination of Tashiro et al. and Tsuchiya et al. does not expressly teach that the matching circuit comprises only one variable impedance element.

Deguchi et al. teaches that a matching circuit 14 for a variable frequency RF source 12 should comprise a fixed set of series components and a variable shunt capacitor 22 connected to ground. (Figure 1 ; EMT, Paragraphs 13-16)

It would have been obvious to one of ordinary skill in the art to modify the matching cirucit taught by the combination of Tashiro et al. and Tsuchiya et al. to comprise only one variable impedance element, as taught by Deguchi et al. The motivation for making such a modification to the matching circuit, as taught by Deguchi et al. (English Machine Translation, Paragraphs 11, 19, 20, 30, and 31), would have been that the combination of such a matching sub-circuit with a variable frequency RF source (as taught by Taylor et al.) allows the impedance of the RF signal to be matched to the impedance of the plasma quickly with fewer variable capacitors and overall smaller equipment size by varying the frequency of the RF signal generated by the RF source and by varying the shunt capacitance.

In regards to Claims 2 and 3, Tashiro et al. teaches that the power level of the first RF signal can be 50 Watts. (Paragraphs 28, 30, and 43; *[In] Example 1…RF of 50 W was first impressed… Drawing 4 is the…diagram showing the structure of the VHF plasma-CVD equipment which is the 4th example concerning this invention. It is fundamentally the same as an example 1 except the electrode section of a membrane formation chamber.*)

In regards to Claim 4, Tashiro et al. teaches that the chamber pressure is 0.1 Torr. (Paragraph 44)

The combination of Tashiro et al., Tsuchiya et al., and Deguchi et al. discussed above does not expressly teach that the process gas is any of the claimed process gases.

Tsuchiya et al. teaches that a process gas comprises a carbon- and fluorine-containing gas (CF_4). (Paragraph 68)

It would have been obvious to one of ordinary skill in the art to supply a carbon- and fluorine-containing gas to the plasma chamber taught by the combination of Tashiro et al., Tsuchiya et al., and Deguchi et al., as taught by Tsuchiya et al. The motivation for making such a modification, as taught by Tsuchiya et al. (Paragraph 68), would have been to perform plasma etching, in instead of the coating taught by Tashiro et al.

In regards to Claim 5, Tashiro et al. teaches coupling the first RF signal to the first electrode 410 of the plasma processing system using a first matching network 412, and tuning the first matching network to an initial condition for plasma ignition. (Paragraph 45)

In regards to Claim 11, Tashiro et al. teaches that the first signal is provided for a first time period, and the second signal is provided for a second time period. (i.e. each from a defined start time to an end time; Paragraphs 45 and 49; Figure 8)

In regards to Claims 13 and 14, the combination of Tashiro et al., Tsuchiya et al., and Deguchi et al. discussed above does not expressly teach the recited steps.

Tsuchiya et al. teaches that a plasma processing method can comprise: determining a forward power for a first RF signal used to ignite the plasma and being provided by the first frequency source; determining a reflected power for the first signal being returned to the first frequency source; and determining when the plasma has been ignited using the forward power and the reflected power. (Paragraphs 59-65 and 108)

It would have been obvious to one of ordinary skill in the art to include the steps taught by Tsuchiya et al. of determining ignition using forward and reflected power in the method taught by Tashiro et al. The motivation for making such a modification, as taught by Tashiro et al. (Paragraph 60), would have been to allow the impedance of the matching unit to be optimized at the moment of plasma generation.

In regards to Claims 15 and 16, the combination of Tashiro et al., Tsuchiya et al., and Deguchi et al. does not expressly teach the claimed steps.

Tsuchiya et al. teaches that the ignition and maintenance of the plasma are determined using at least one optical frequency obtained by an optical frequency monitoring system coupled to the processing chamber. (Paragraphs 73, 78, 79, 82)

It would have been obvious to one of ordinary skill in the art to modify the method taught by the combination of Tashiro et al., Tsuchiya et al., and Deguchi et al. to include the detection steps taught by Tsuchiya et al. The motivation for making such a modification, as taught by Tsuchiya et al. (Paragraphs 79-82), would have been to use an alternate means of detecting plasma generation, both to ensure plasma generation and to allow for the timed optimization of the process settings.

In regards to Claims 17 and 18, the combination of Tashiro et al., Tsuchiya et al., and Deguchi et al. discussed above does not expressly teach the claimed steps.

Tsuchiya et al. teaches tuning the first matching network form the initial condition to an operating condition, and verifying that the plasma has not extinguished. (Paragraphs 90-97) Tsuchiya et al. also teaches that the first matching network is tuned

from the initial condition to the operating condition in less than 4 seconds (about 1 second). (Paragraphs 117 and 121)

It would have been obvious to one of ordinary skill in the art to modify the method taught by the combination of Tashiro et al., Tsuchiya et al., and Deguchi et al. to include the tuning and verification steps as taught by Tsuchiya et al. The motivation for making such a modification, as taught by Tsuchiya et al. (Paragraph 90), would have been to optimize the impedance of the matching network at the moment of ignition to maximize the proportion of RF power coupled with the plasma and retain the plasma efficiently.

In regards to Claim 19, the combination of Tashiro et al., Tsuchiya et al., and Deguchi et al. discussed above does not expressly teach coupling a second RF source to the second electrode (and substrate support) 409 and providing additional power to the plasma.

Tsuchiya et al. teaches that a plasma processing method further comprises coupling an RF source 50 to second electrode (and substrate support) 5; and providing additional power to the plasma. (Paragraphs 56 and 57)

It would have been obvious to one of ordinary skill in the art to couple an RF source to the second electrode taught by the combination of Tashiro et al., Tsuchiya et al., and Deguchi et al. and to supply additional power to the plasma, as taught by Tsuchiya et al. The motivation for making such a modification, as taught by Tsuchiya et al. (Paragraph 56), would have been to generate a self-biasing voltage at the substrate to be processed to control the ion incidence on the substrate.

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tashiro et al. in view of Tsuchiya et al. and Deguchi et al. as applied to Claim 11 above, and further in view of U.S. Patent 5,441,596 to Nulty.

The teachings of the combination of Tashiro et al., Tsuchiya et al., and Deguchi et al. were discussed above in regards to Claim 11.

In regards to Claim 12, the the combination of Tashiro et al., Tsuchiya et al., and Deguchi et al. does not expressly teach that the first time period has a duration that ranged from about 10 ms to about 1 s.

Nulty teaches that a first RF signal can be applied for a time period of 1 s. (Column 4, Lines 1-16)

It would have been obvious to one of ordinary skill in the art to modify the method taught by the combination of Tashiro et al., Tsuchiya et al., and Deguchi et al. to have the first time period be only 1 s long. The motivation for making such a modification, as taught by Nulty (Column 2, Lines 37-45, Column 4, Lines 1-16, Column 6, Lines 47-56), would have been to consistently, repeatably ignite the plasma while still expanding the operating range of the plasma process to higher powers and lower pressures.

Response to Arguments

7. Applicant's arguments filed 13 November 2007 have been fully considered but, in so far as they still apply, they are not persuasive.

In response to applicant's arguments against the teachings of Taylor et al., these arguments are not persuasive. Applicant argues that Taylor et al. only teaches using a single power supply for generating multiple frequencies in the context of supplying a

mixed frequency signal, and does not teach using a single power supply to generate first a higher frequency RF signal and then a lower frequency RF signal as claimed. This is not persuasive, because Taylor et al. expressly teaches that "it is not intended the present invention be limited to" just the scenario wherein separate power supplies are provided, and that "a single power supply might be employed which is capable of generating multiple RF signals of differing frequency." (Column 7, Lines 43-48) While Taylor et al. does discuss this structural feature of the plasma processing apparatus in the context of supplying a mixed frequency signal, if a single power supply capable of generating multiple frequencies were provided as part of the apparatus, then this same power supply would be used during the ignition and sustaining process described by Taylor et al. at Column 7, Lines 1-13.

Moreover, as set forth in the same grounds of rejection in the last office action, even if Taylor et al. were considered to *not* expressly teach this feature of the claimed invention, it still would have been obvious to one of ordinary skill in the art to substitute a single power supply capable of generating multiple frequencies for two separate power supplies each capable of generating only a single frequency, as an art-recognized (as taught by Taylor et al.) equivalent means for performing the predictable result of supplying RF signals of different frequencies. Even if Taylor et al. were considered not to *expressly* teach this feature of the claimed invention, Taylor et al. cannot be said, as applicant argues, to teach *away* from this feature, particularly as Taylor et al. does disclose the use of a single power supply capable of generating multiple frequencies. Moreover, *KSR International Co. v. Teleflex Inc.,* 550 U.S.--, 82

USPQ2d 1385 (2007) forecloses the argument that a *specific* teaching, suggestion, or motivation is required to support a finding of obviousness.

In response to applicant's arguments against the references individually, specifically that secondary reference Tsuchiya et al. does not teach that RF signals from separate RF sources are applied to a common electrode, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Specifically in regards to applicant's argument that Tashiro et al. does not teach all of the steps of the claimed method, and that Tashiro et al. teaches that the disclosed method of Tashiro et al. results in increased deposition rates of "good amorphous silicon," this is to consider only the teachings of a single reference where the rejection is based on the combination of two references, Tashiro et al. and Tsuchiya et al. It is the teachings of Tsuchiya et al. that would have motivated one of ordinary skill in the art to make the modifications to the method of Tashiro et al. as discussed in the rejection above, with a reasonable expectation of success in attaining the benefits taught by Tsuchiya et al. and discussed above. Moreover, just because a reference teaches a different way of attaining a desired result, even what the reference considers to be the best way of attaining the result, does not mean that the reference teaches away from any other way of attaining the desired result. Examiner maintains that while Tashiro et al. may discuss some problems *with the prior art of Tashiro et al.* (i.e. in Paragraphs 15 and 16), and disclose what Tashiro et al. believes to be the best way of overcoming the

problems with the prior art, Tashiro et al. does not teach away from a combination with Tsuchiya et al., with the motivation and cited benefits of the teachings of Tsuchiya et al. Nor would one of ordinary skill in the art at the time the invention was made, upon reading Tashiro et al., have been led in a direction divergent from the path that was taken by Applicant. Rather, one of ordinary skill in the art at the time the invention was made, upon reading Tashiro et al., would have been led to implement a method of operating a plasma processing system with a dual-RF frequency supply to a single electrode, and would have been motivated, upon reading Tsuchiya et al., to modify that method in the manner suggested as beneficial by Tsuchiya et al. The mere fact that such implementation may have been difficult is not to establish that such implementation would have been beyond the skill and motivation of one of ordinary skill in the art.

It is also noted that Tsuchiya et al. is a secondary reference relied on in the rejection of independent Claim 1 for the teaching that a higher RF frequency can be used to ignite the plasma and a lower RF frequency can be used to sustain the plasma, with the benefit of increasing plasma generation efficiency by igniting the plasma with a frequency in the VHF band, but avoiding weakening the sheath electric field by having the frequency being too high during processing. It is the teachings of Tashiro et al. that are to be modified by the teachings of Tsuchiya et al., not the reverse.

In response to applicant's argument that the matching elements and protective circuits of Tsuchiya et al. are not designed for providing protection at two different frequencies or to match the frequency change from VHF range to HF range, and that

Tsuchiya et al. teaches a dual electrode, separate power supply apparatus where Tashiro et al. teaches a single electrode, single power supply apparatus, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See In re Keller, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Applicant's citation of *KSR International Co. v. Teleflex Inc. et al.* in arguing agasint the obviousness rejection over Tashiro et al. in view of Tsuchiya et al. is not persuasive. Applicant has shown no evidence of unexpected results tending to prove non-obviousness. While the method claimed by Applicant may produce *different* results than either of Tashiro et al. or Tsuchiya et al. alone, there is no reason to conclude that such results are *unexpected* compared to the results of a method that would have been obvious to one of ordinary skill in the art in view of the teachings of Tashiro et al. and Tsuchiya et al. Likewise, Applicant has shown no evidence of long-felt need and a failure of others to meet that need that would be relevant to the instant question of obviousness. To assert that the failure of a single reference alone to teach all elements of the claimed invention where the rejection is based upon a combination of references is equivalent to a failure of others to meet a long-felt need in the art (which has not even been established) is again to engage in piece-meal analysis of the cited art.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maureen G. Arancibia whose telephone number is (571)272-1219. The examiner can normally be reached on core hours of 10-5, Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Maureen G. Arancibia/
Examiner, Art Unit 1792

/Parviz Hassanzadeh/
Supervisory Patent Examiner, Art Unit 1792